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Organic Solvent Use in Web-Coating Operations

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A questionnaire concerning organic solvent use was sent to 1402 plants which perform coating or laminating of paper, fabric, film or foil (collectively known as web-coating). Based on the questionnaire results, estimates were made of national annual solvent use for major web-coating industries. These estimates are summarized in the report. Types of control devices and amount of control achieved for these industries is given. The report also lists estimated growth rates for each industry.

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1.0 INTRODUCTION

During August of 1979, the U.S. Environmental Protection Agency published a priority list of 59 source categories designated for the development and promulgation of New Source Performance Standards (NSPS).[1] This list ranked the source categories by their quantities of emissions, health impacts, and mobilities.

Paper coating was ranked fourth, and fabric coating was ranked tenth. Since both paper coating and fabric coating include an almost infinite variety of products, EPA later decided that it would be impractical to write a single NSPS for the entire group of products. Rather, EPA began to identify those web-coated products which require large amounts of solvent for their manufacture and to prioritize these products for subsequent NSPS development. This report is part of the prioritization. "Web coating," as used in this report, includes the coating and laminating of film and foil webs as well as paper and fabric; it does not include printing.

This report presents the results of a study conducted to gather background information on the consumption of organic solvents associated with the manufacture of web-coated products. The study began with a search to identify products produced by coating or laminating web substrates. Since data on solvent usage in the manufacture of these web-coated products is not available in the literature, a survey was conducted to obtain solvent use data directly from manufacturers.

To determine solvent use, questionnaires were sent to a random sample of manufacturers identified in 13 Standard Industrial Classification (SIC) codes, to all manufacturers of magnetic tape, and to manufacturers of photographic products through the National Association of Photographic

Manufacturers (NAPM). The 13 SIC codes were chosen to cover the major portion of industrial web coating and laminating operations.

The results of the survey are summarized in Chapter 2.0. Detailed explanations of the survey methodology and data evaluation are found in Chapters 3.0 and 4.0, respectively.

2.0 SUMMARY OF SURVEY RESULTS

The survey yielded data on solvent usage and air pollution control techniques and efficiencies. It also collected data on products that do or do not require solvents in their manufacture, and it identified web-coated products. Growth rates for the products were collected independently of the survey.

Table 2.1 summarizes the data collected in this survey on solvent usage, percent control, and growth rates for web-coated products. Data concerning two products, pressure sensitive tapes and labels and flexible vinyl coatings, were collected from other EPA studies[2,3] and are included in Table 2.1. Most of the solvent usage data in Table 2.1 are for the year 1979.

Of all the estimated yearly solvent usage data, those for photographic film and paper and magnetic tape are considered the most reliable because of the high percentage (estimated 99%) of the total industry surveyed. The other solvent usage data are not as reliable, but are reasonable estimates.

2.1 Miscellaneous Categories

Table 2.1 lists estimated yearly solvent usage for four miscellaneous categories. A list of the products in these categories that require solvents for their production is presented in Table 2.2.

2.2 Shoes and Handbags

Manufacturers with SIC codes specific to shoes and handbags were not surveyed. However, one questionnaire was received from a shoe-fabric maker, and the potential for a large solvent usage was indicated for this category. Several other questionnaires were received from plants that make shoe soles and heels and soling sheets. Solvent usage for these plants was also large. Accordingly, a potential standard-setting category does exist, but a

TABLE 2.1. SUMMARY OF SURVEY DATA FOR WEB-COATED PRODUCTS

Product	Estimated Yearly Solvent Usage (Metric Tons)	Industry Overall Percent Controlled(%)	Annual Growth Rate(%)
Pressure Sensitive Tapes and Labels[2]	600,000*	Unk	10.0
Flexible Vinyl Coating[3]	68,670*	Unk	2.0
Flexible Packaging	41,200	7.1	4.0
Photographic Products	38,000	46.4	9.9
Magnetic Tape	32,710	46.4	13.3
Rubber-coated Fabrics	31,190	18.6	8.0
Vinyl Floor Coverings	23,090	19.7	7.3
Gift Wrap	20,780	0	2.3
Office Copier Paper	15,550	90.0**	2.5
Inked Ribbons	14,860	57.0	5.3
Nitrocellulose Coated Products	9,130	40.2	1.5
Rubber and Plastic Belts	8,580	43.8	8.6
Wallcoverings	6,690	7.1	>2.3
Sandpaper	3,260	0	4.5
Carbon Paper	2,670	7.2	5.3
Metal Foil and Leaf (other than packaging)	2,550	41.7	11.3
Polyurethane Coated Fabrics	2,380	0	8.0
Gaskets, Packing, and Sealing Devices	1,510	7.9	11.0
Shelf Paper	790	0	2.3
Manifold Business Forms	90	0	4.0
Oil, Waxed, and Wax-laminated Paper	80	0	1.5
Rubber Hose (except garden hose)	40	0	7.6
Other Hose and Belts	10	0	?
Subtotal	923,830		
Miscellaneous Categories			
Miscellaneous Coated Products	38,990	16.2	-
Laminated or Coated Rolls and Sheets (paper)	15,670	3.2	1.5
Other Coated Fabrics	5,300	11.7	4.5
Miscellaneous Laminated Products	1,270	10.0	-
Other Fabricated Rubber Products	1,050	0	2.5
Subtotal	62,280		
TOTAL SOLVENT USAGE	986,110		

* Estimated annual emissions, from References 2 & 3.

** Percent controlled number based on data from one plant. This number is probably high for the entire industry.

Unk = unknown

TABLE 2.2. MISCELLANEOUS PRODUCTS REQUIRING SOLVENTS IN THEIR MANUFACTURE

Miscellaneous Coated Products

- Acetate color filters
- Acrylic-coated book covers
- Adhesive-coated papers
- After-exposure label paper
- Aluminum pigment coated cloth
- Automatic transmission plates
- Automotive clutch and filters
- Barrier-coated papers
- Bottle capliners
- Car sound-deadening materials
- Chemical sterilization indicators
- Coating of closed-cell foam
- Coating of polyester film with foil
- Decorative laminates
- Dry-gum adhesive paper
- Flexo-print envelope paper
- Flocked board
- Friction plate
- Impregnated chemical test paper
- Industrial textiles
- Kraft paper
- Kraft paper honeycomb
- Laminated glass/asbestos/polyester
- Mimeograph stencil paper
- Paper plates
- Polyethylene and nylon films
- Polyurethane foam
- Rag (100%) tracing papers & vellums
- Reflective sheeting for highway signs
- Reproduction papers (data graphics)
- Supported and unsupported transfer adhesive
- Transparentized paper
- Typewriter ribbon cover-up
- Varnish coating
- V-belt thread
- Waterproof writing paper

Other Coated Fabrics

- Adhesive-coated glass-cloth
- Aircraft insulation
- Buffing wheels
- CAB lacquer on fabric
- Card cloth foundations
- Flocked fabrics
- Friction materials
- Phenolic-coated fabric
- Polishing buffs of cotton, sisal, etc.
- Scrim coat
- SRM-nonwoven fabric composite
- Table covers
- Vinyl organasol-coated fabrics
- Window shades

Other Fabricated Rubber Products

- Blood pressure bags
- Custom molded rubber goods
- Fabricated latex foam rubber sheets and shades
- Friction materials
- Laminated shoe soles and heels
- Molded rubber to metal
- Rollers
- Perimeter sealing devices
- Rubber and plastic linings for tanks, pipes, and valves
- Synthetic rubber-soling sheets

Miscellaneous Laminated Products

- Cable wrap
- Plastic and captan film to metal
- Polyester/paper for printed circuit boards
- Pressure sensitive adhesives on foam rubber
- Reinforced plastic and rubber
- Various materials (vinyl, cotton, foam, fabric, Tricot, etc.) for shoes and handbags
- Vinyl plastic to particle board
- Vulcanized fiber

negative growth rate (-11.9%) has been projected by the U.S. Department of Commerce for the "rubber and plastic footwear" category.[4]

3.0 DATA COLLECTION METHODOLOGY

Data collection was completed in three steps: identifying the plants to be surveyed, conducting the survey, and evaluating the questionnaires.

3.1 Identification of Plants

The basis for the plant identifications was 13 Standard Industrial Classification (SIC) codes. These codes were chosen by examining a list of SIC codes and selecting those codes in which web coating and laminating operations were likely to exist. In addition, magnetic tape producers (no SIC code) were selected as directed by EPA.

Dun's Market Identifiers file, a product of Dun and Bradstreet Corporation, was used as the primary source for plant identification. The file was used to generate mailing labels for plants in each of the 13 SIC codes. All plants with total employment of less than ten were ignored.

Some operational restrictions can arise from the use of Dun's Market Identifiers as a complete sampling frame. For the purpose of this survey, a plant (i.e., business establishment) is a unit record in the Identifier's file. The file contains approximately four million unit records. However, its completeness is unknown in regard to a total defined population of business establishments.

Plants producing magnetic tape were identified by talking with people who were knowledgeable of such plants and by calling firms listed in the Thomas Register under the categories of video, audio, and computer tapes. This procedure identified twenty one plants.

Plants producing photographic film and paper (SIC 3861) were identified in a different manner. During discussions with environmental representatives from several large film producers, they all agreed to cooperate if the

survey were conducted through the National Association of Photographic Manufacturers (NAPM). The NAPM was contacted and agreed to assist. Thus, the listing of representative plants was not necessary. The Dun's file for SIC 3861 was used as a supplementary source of plants not included in the NAPM survey.

The SIC codes surveyed and the number of establishments in the Dun's file with 10 or more employees are listed in Table 3.1.

TABLE 3.1. SIC CODES USED FOR PLANT IDENTIFICATION

SIC Code	SIC Descriptors	Number of Plants*
2295	Coated fabrics, not rubberized	216
2641	Paper coating and glazing	518
2649	Converted paper and paperboard products	669
2761	Manifold business forms	478
2771	Greeting card publishing	141
3041	Rubber and plastics hose and belting	160
3069	Fabricated rubber products	1376
3291	Abrasive products	301
3293	Gaskets, packing, and sealing devices	376
3497	Metal foil and leaf	54
3861	Photographic equipment and supplies**	651
3955	Carbon paper and inked ribbons	101
3996	Linoleum, asphalted-felt base, and other hard surface floor coverings	22
____	Magnetic tape	21
	TOTAL	5084

*Number of plants with ten or more employees.
**Also surveyed through the National Association of Photographic Manufacturers.

3.2 The Plant Survey

A two-phase design using four-digit SIC codes as the stratification variables was used for the survey. The survey was approved by the Office of Management and Budget (OMB No. 2000-0122). During the first phase, a total sample of 1402 plants (27.5 percent of the 5084 total) was to be allocated to the strata in proportion to their relative sizes, as measured by the number of plants in each SIC code. However, all of the plants in the smaller categories identified by SIC codes 3497 and 3966 and magnetic

tape producers were surveyed, but the total number of plants was kept at 1402. Using this procedure, 26 percent of the plants, other than those in SIC's 3497 and 3996 and magnetic tape producers, were surveyed. The breakdown of the number of plants surveyed is shown in Table 3.2.

The first phase of the survey was conducted by mail. A questionnaire, a product code list, instructions for completing the questionnaire, and a covering letter were sent to randomly selected plants named in the Dun's file. A copy of the survey package is in Appendix A.

After approximately 21 days, a postcard was sent to all respondents who had not returned the questionnaires. The postcard served as either a reminder or as a thank you (in cases where the plant had returned the questionnaire but it had not been received). The postcard is reproduced in Appendix A.

Phase one netted 1094 completed responses, or 78 percent of the total originally sent.

TABLE 3.2. NUMBER OF PLANTS SURVEYED

SIC Code	SIC Descriptor	Number of Plants	
		Total	Surveyed
2295	Coated fabrics	216	56
2641	Coated paper	518	135
2649	Converted paper	669	176
2761	Business forms	478	124
2771	Greeting cards	141	37
3041	Hoses and belts	160	42
3069	Fabricated rubber products	1376	360
3291	Abrasive products	301	79
3293	Gaskets, packings, and seals	376	98
3497	Metal foil	54	54
3861	Photographic equipment	651	171
3955	Carbon paper and inked ribbons	101	27
3996	Floor coverings	22	22
----	Magnetic tape	21	21
	TOTALS	5084	1402

Phase two of the survey consisted of telephone calls to nonrespondents of phase one. Calls were made to the company official (usually the president

or plant manager) listed on the Dun's printout. An effort was made to get information needed for the survey while on the phone; if this was not possible, a deadline for return of the questionnaire was agreed on, the deadline was monitored, and the plant was called again if the questionnaire was not received on the promised date.

For various reasons, certain nonrespondents were not called. For SIC 2761 (Manifold Business Forms), only 2 of 101 responses showed solvent use, so nonrespondents were not called. For SIC 3069 (Miscellaneous Rubber Products) and SIC 3861 (Photographic Equipment), respondents were called on a selective basis, depending on the product listed on the Dun's printout. For SIC 3069, many nonrespondents were molders or fabricators of rubber parts, did not use webs or solvents, and thus were not called. For SIC 3861, many nonrespondants manufacture camera equipment, design electronic components of camera equipment, or make movies, so these were not called.

Of the 1402 questionnaires sent out, 1274 responses (or 91%) were received. Some respondents sent questionnaires from all of their plants so considerably more questionnaires were received from some companies than were sent out.

3.3 The Questionnaire Evaluation

The data from each questionnaire returned were first recorded on a summary sheet for each product code and then examined for completeness and reasonableness. Data inconsistencies or deletions were checked by telephone with the person listed on the questionnaire. Those questionnaires on which no web coating or solvent usage (Item II) was checked were tallied by product code and were filed separately from those showing solvent usage.

A common occurance was the combining of the solvent usage data for two or more products. In these cases, the respondents were asked to break down the data into separate product codes. If the respondent could not do this, the usage was assigned equally to each product code.

4.0 DATA EVALUATION METHODOLOGY

Data evaluation was conducted as four steps: data reduction, product code combination, calculation, and growth projection. Due to the availability of a previous survey of the flexibile packaging industry, data from this group of plants were evaluated differently as explained in Section 4.6.

4.1 Data Reduction

Data from the survey responses were grouped according to product code and recorded. A product code is a numerical designation arbitarily assigned to various products (see Product Code List in Survey Package, Appendix A). Because emission estimates for flexible vinyl coating and pressure sensitive tape and label manufacturing have already been made as part of a NSPS background study, questionnaires received from these industries were not included in the survey. After all the responses were received and logged, the data for solvent usage under each product code were recorded on the product summary and calculation sheets (shown in Appendix B). In addition to information on the quantities of solvent in or added to the coatings and adhesives, used to process the reported products and for equipment cleanup, the sheets also include data on the number, type, and efficiencies of pollution control devices used, and the total quantity of solvent that entered the control devices, the total quantity exhausted from the control devices, and an average control efficiency for all the control devices in use.

Other data recorded from the questionnaires included the total number of plants surveyed and the number of plants using and not using solvents. In cases where the survey respondent selected one of the general product codes (e.g. "other coated fabrics" and "other laminating"), the specific product as indicated by the respondent was listed under the remarks portion of the summary and calculation sheets.

4.2 Product Code Combination

As the survey responses were accumulated and the data recorded, it became apparent that several product codes needed to be combined to properly evaluate the solvent usage data. For example, the original Product Code List provided in the survey package (Appendix A), included codes for "nitrocellulose bookcovers - fabric substrate" and "nitrocellulose bookcovers - paper substrate." Since only one questionnaire was received for fabric substrate, these two codes were combined. Several respondents specified other nitrocellulose coated products such as photomounts under the "other coated or converted paper products" category. These responses were also combined, and a new category entitled "Nitrocellulose Coated Products" was formed. Other product codes that were combined are listed below:

1. "Wallcovering - fabric substrate" and "wallcovering - paper substrate" became "wallcoverings,"
2. "Giftwrap paper - except foil" and "giftwrap - foil" became "giftwrap,"
3. "Coated carbon paper" and "carbon film sheets" became "carbon paper,"
4. "Inked ribbons - fabric" and "inked ribbons - film" became "inked ribbons,"
5. "Gaskets and gasketing materials" and "packing and sealing devices" became "gaskets, packing, and sealing devices,"
6. "Capacitor foil" and "other foil or leaf" became "metal foil and leaf,"
7. All photographic film, paper, and cloth became one category, and
8. "Video tape," "audio tape," "computer tape," and "other magnetic tape" became "magnetic tape."

4.3 General Product Codes

To accomodate the listing of otherwise non-classifiable and/or unique products, twelve general product codes were included in the survey's product code list. These were:

other coated fabrics	other coated or converted paper products
other carbon paper	other hose or belts
other abrasive products	other fabricated rubber products
other foil or leaf	other film paper or cloth
other floor coverings	other magnetic tape
other coating	other laminating

Except for those codes combined with other product codes as mentioned previously (Section 4.2), each general product code was treated separately.

The general product codes were frequently chosen by respondents at plants that operated as custom job shops. These plants produce a wide variety of products, many of which were difficult to categorize.

4.4 Calculation

The control device performance figures and the estimated yearly solvent usage figures were obtained by calculations. They are recorded on the product summary and calculation sheets.

The equations used to make the performance data calculations are presented below. The left side of the calculations correspond to the headings on the data sheets in Appendix B. The terms used in the calculations are:

A = Total solvent usage (i.e., total in coatings as purchased, added to coatings, and for cleaning) summed for each product category from the questionnaires,

B = Quantity of solvent entering each control device (reported as Item IV B on the survey questionnaire),

C = Quantity of solvent exhausted from each control device (Item IV C on the survey questionnaire),

D = Total quantity of solvent entering all control devices on exhaust lines of all surveyed plants producing products in the category ($D = \Sigma B$), and

E = Total quantity of solvent exhausted from all control devices on all surveyed plants producing products in the category ($E = \Sigma C$).

$$\text{Control Device Efficiency } (\%) = \left(1 - \frac{C}{B}\right)(100)$$

$$\text{Average Control Device Efficiency } (\%) = \left(1 - \frac{E}{D}\right)(100)$$

$$\text{Proportion of Total Solvent Entering Control Devices (\%)} = \frac{D}{A}(100)$$

$$\text{Overall Industry Percent Control (\%)} = \frac{D-E}{A}(100)$$

The estimated yearly solvent usage (Y) was calculated for each product category by two methods. The first method assumes the solvent usage of the sample is typical of the industry and uses as a multiplier the ratio of total plants in the industry to plants surveyed:

$$Y = \frac{N}{M}(A)$$

where: Y = the estimated yearly solvent usage for the product (tons/yr),

N = the number of plants from the Census of Manufacturers,

M = the number of plants included in the survey, and

A = the total solvent usage.

In the second method, total solvent usage was scaled upward by 3.85, the sampling proportion of the survey (i.e., 100% ÷ 26.0%; see Section 3.2).

These procedures were not used for photographic film and paper and magnetic tape because of the essentially total industry coverage afforded these two categories by the survey. It is estimated that solvent usage from 99 percent of the plants in these categories was included in the survey.

Estimated yearly solvent usage values calculated by both of the methods described above are reported on the product summary and calculation sheets in Appendix B. To prepare Table 1 (Section 2.0), the higher of the values was chosen because of the survey methods. In explanation, the list of plants surveyed was generated from a file of plants (Dun's Market Identifiers) classified by four-digit SIC codes; 26.0 percent of the plants in each SIC code listing (with exceptions noted previously) were randomly selected to receive the survey package. Ideally, 26.0 percent of the plants producing a specific product would also be selected, however, this did not occur due to two factors. Primarily, four-digit SIC codes are broad and thus not specific enough to select for the products which were to be examined in the survey. Additionally, it was discovered through tabulation of survey data that many plants in Dun's file were misclassified

(i.e., plants that were listed in one SIC category actually produced web-coated products that belonged in another category) and that often the file was incomplete. This resulted in the decision to use listings in the Census of Manufacturers which include a breakdown in number of plants up to six-digit SIC codes as the reference in determining the total number of plants producing a specific product. Obviously, in many cases, more or less than 26.0 of a particular product's industry were actually surveyed.

To arrive at the most conservative figure, the scale-up method which provided the higher value was used to calculate the estimated yearly solvent usage. In cases where the number of returned questionnaires was considerably less than 26.0 percent of the CM reference number of plants, the first scaleup method described above was used. In cases where the number of returns was considerably more than 26.0 percent of the number of plants, the second scale-up method was used. While the assumptions that were made could lead to some errors, the results obtained are considered to be reasonable estimates of estimated yearly solvent usage for the manufacture of the product listed in Table 2.1.

4.5 Growth Projection

Growth projections for various products were obtained from several sources.[4,5,6,7,8,9,10] Growth predictions were used if available; if not, however, historical data were projected to 1985. In projecting historical data, quantity data and value data in constant dollars (i.e. adjusted for inflation) were preferred over unadjusted value data. The projections are shown on the product summary sheets (Appendix B).

4.6 Flexible Packaging

Questionnaires from 32 plants engaged in the manufacture of flexible packaging were received and evaluated in the same manner as the data on other products. Additionally, the results of a 1978 emissions study[11] of the flexible packaging industry were included in the analysis for comparison. The Flexible Packaging Association (FPA) checked the 32 plants surveyed against the list of plants that participated in the 1978 study. Thirteen

of these plants had not been included in the 1978 study, so the solvent usage data from these were added to data from the 1978 study.

The results generated by the two data evaluation methods are shown below:

Method 1

Total Solvent Usage from Questionnaires -- 5273 metric tons
Number of Plants in Survey -- 32
Total Number of Plants in Industry -- 250
Estimated Yearly Solvent Usage:

A. By ratio of FPA total plants (i.e., $\frac{250}{32}$) -- 41,195 metric tons

B. By factoring upward by 3.85 -- 20,301 metric tons

Method 2

Total Solvent Usage from FPA Survey -- 32,024 metric tons
Number of Plants in Survey -- 106
Total Number of Plants in Industry -- 250
Estimated Yearly Solvent Usage -- $\frac{250}{106} \times 32{,}024 = 75{,}528$ metric tons

For Method 2, the total solvent usage (Table 2 of the 1978 report[4]) includes solvent used for coatings, varnishes, adhesives, and cleaning, but not printing. The number of plants in the survey (i.e., 106) is the total number of questionnaires received in the 1978 survey (i.e., 154) minus the number of plants showing greater than 90 percent of solvent use in printing operations (i.e., 48). The estimated yearly solvent usage was obtained by multiplying total solvent usage by the ratio of the number of plants that coat or laminate (Reference 9) to the number of plants in the survey (i.e., $\frac{250}{106} \times 32{,}024$).

4.7 Vinyl Floor Covering

The solvent usage number for Vinyl Floor Covering in Table 2.1 is the smaller number (23,090 metric tons) of the two numbers calculated by the two methods explained in Section 4.4. The smaller number was chosen because it was closer to the number (18,700 metric tons) generated in another study done for EPA.[12]

5.0 REFERENCES

1. Federal Register, August 21, 1979, page 49222.

2. "Pressure Sensitive Tape and Label Surface Coating Industry-Background Information for Proposed Standards," U.S. EPA, EPA-450/3-80-003a, September 1980, pages 3-2 and 3-3.

3. "Discussion of Aerosol and VOC Emissions from the Flexible Vinyl Coating and Printing Industry," meeting report, Radian Corp. to U.S. EPA, July 25, 1980.

4. 1981 U.S. Industrial Outlook, U.S. Department of Commerce, Bureau of Industrial Economics, Washington, D. C. January 1981.

5. Predicast's Basebook, Predicast's, Inc., Cleveland, Ohio, November 1977.

6. Predicast's®, Issue No. 78, 2nd Quarter, Predicasts, Inc., Cleveland, Ohio, January 18, 1980

7. "Converting Industry Could See Moderate Growth in 1980," Paper, Film, and Foil Converter, McLean-Hunter Publishing Corp., Chicago, February 1980, pages 100-104.

8. Telephone conversation between Mr. Tom Dunn, National Flexible Packaging Association, and Mr. George Weant, Engineering-Science, May 26, 1981.

9. Census of Manufacturers, 1977, Bureau of the Census, Department of Commerce, Washington, DC.

10. The Industrial Fabrics Market (U.S.), promotional bulletin, Frost & Sullivan, Inc., New York, Spring 1980.

11. Boies, D. B., E. K. Schumann, and F. S. Scofield, "Overview Assessment of Organic Emissions of the Flexible Packaging Industry," report by WAPORA, Inc., EPA Contract No. 68-03-2580, 1978.

12. "Source Category Survey Report, Resilient Flooring Industry," draft report, to U.S. EPA, OAQPS, Research Triangle Park, N.C., June 23, 1980.

APPENDIX A

SURVEY PACKAGE AND REMINDER/THANK YOU POSTCARD

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

February 16, 1981

Dear Sir:

The Environmental Protection Agency of the United States Government is engaged in a study of atmospheric emissions from web coating operations. The purpose of the study is to gather information on the technology and economic aspects of air pollution control, to provide a national inventory of emissions, and to help establish national standards of performance for new stationary sources as defined in Section 111 of the Clean Air Act, as amended August 1977. Particular portions of the Act which are directly applicable to this work are Sections 103, 111 and 114.

The information supplied in the questionnaire will be received and reviewed by EPA. This data will be further reviewed and analyzed by an EPA contractor. The contractor will use this data as part of the background for reports on web coating operations which will be written by the contractor for EPA. In these reports, questionnaire data will be summarized. These reports will not disclose the identity of any plant or company along with specific questionnaire data from the plant, although the questionnaire data will be maintained in EPA files that are required to be open to the public.

Response to this questionnaire is required by law (Section 114 of the Clean Air Act, 42 U.S. Code, Paragraph 7414). Please complete the enclosed survey form by March 20, 1981, and return it to the Environmental Protection Agency. Completed forms should be mailed to:

William L. Johnson
Web Coating Survey
Emission Standards and Engineering Division (MD-13)
Environmental Protection Agency
Research Triangle Park, North Carolina 27711

It is the opinion of this office that all survey questions can be answered without revealing any confidential information or trade secrets. However, EPA is empowered to obtain this information even if you consider it to be confidential. If you believe that disclosure of part or all of the information submitted would reveal a trade secret, you should clearly identify such information when you return the questionnaire. If you wish you may also set forth reasons for your claim and include supportive data or legal authority at the time the claim is submitted. Any information subsequently determined to constitute a trade secret will be protected under Title 18, U.S. Code, Section 1905. All emission data, however, will be available to the public.

Sincerely yours,

Don R. Goodwin
Director
Emission Standards and
Engineering Division

Enclosure

OMB No. - 2000-0122
Expires - October 1, 1981

WEB COATING AND LAMINATING QUESTIONNAIRE

General Instructions

Clarification of items in this survey may be obtained from Mr. William Johnson, EPA, by telephone at (919) 541-5305.

This questionnaire is concerned with coating or laminating operations on fabric, paper, plastic film, or metallic foil that result in emission of volatile organic compounds to the atmosphere. Coating on these substrates is referred to collectively as web coating and includes coatings applied by roller, reverse roll, blade, air knife, rod, dip or rotogravure coater.

Fill out the questionnaire for each type of product code manufactured at your facility. Product codes are identified in the enclosed Product Code List. If you manufacture several types of products within one product code, (for example, several different types of pressure sensitive tapes) then fill out only one sheet and give answers for the sum of these products. If you produce products from several product codes at your plant, then reproduce the questionnaire sheet and fill out a separate sheet for each product code. Identify the product code in Part I of each questionnaire sheet.

If your plant does not coat or laminate fabric, paper, plastic film or metallic foil, even though making a product from the Product Code list or if you use no organic solvent in coatings, you should check the block in Part II, disregard the remainder of the questionnaire and return the questionnaire to EPA.

In Question III - A, give the amount of organic solvent contained in coatings as the coatings are received from the manufacturer or the amount of organic solvent added to coatings as they are made up in your own plant. In Question III - B, give the amount of additional organic solvent that is added as thinner or to adjust coating properties before the coating is used.

In Question IV-A, if no air pollution control device is used, write "None" in the blank space.

OMB No. - 2000 - 0122
Expires - October 1, 1981
I.D. No. - _____

Web-Coating and Laminating Questionnaire

(Please Type or Print)

Date _____

Facility Name (Include Parent Company Name): _____

_____

Facility Address: _____

_____

Person to Contact for Information Provided on this Questionnaire:

_____ Phone: ( ) _____

I. Product
   A. Enter the Product Code (from the enclosed Product Code List) for this product. _____
   B. If Product Codes 5, 16, 21, 27, 29, 31, 37, 47, 50, 54, 55 or 56 are used, specify the product:
   _____

II. If this product is not a web coated product or is manufactured without the use of organic solvents, check this block, disregard the remainder of this questionnaire, and return the questionnaire to EPA. _____

III. Solvent Usage
   A. Enter the total quantity of solvent received in the coatings, or adhesives used for this product during 1979. _____pounds
   B. Enter the total quantity of solvent added to coatings, and adhesives in this facility for this product in calendar year 1979. _____pounds
   C. Enter the total quantity of solvent used for cleaning equipment for manufacture of this product in 1979. _____pounds

IV. Air Pollution Control Devices
   A. If a control device is used, enter the appropriate code (I = incinerator, C = carbon adsorption, O = other) _____
   Write "None" if control device is not used.
   If other, please define:
   _____
   B. Enter the total quantity of solvent entering the control device in 1979. _____pounds
   C. Enter the total quantity of solvent exhausted to the atmosphere from the control device in 1979. _____pounds

END OF QUESTIONNAIRE

Product Code List

Product	Product Code
Coated Fabrics	
Polyurethane-coated fabrics	1
Rubber-coated fabrics	2
Nitrocellulose bookcovers - fabric substrate	3
Wallcoverings - fabric substrate	4
Other coated fabrics	5
Paper Coating and Coverting (also see codes 17, 18, 19 & 21)	
Office copier paper	
Electrostatic	6
Heat sensitive	7
Oiled, waxed, and wax-laminated paper	8
Nitrocellulose bookcovers - paper substrate	9
Laminated or coated rolls and sheets	10
Gift wrap paper, except foil (for foil, see Code 35)	11
Wallcoverings - paper substrate	12
Computer paper	13
Cigarette paper and packages	14
Shelf paper	15
Other coated or converted paper products	16
Manifold Business Forms	17
Greeting Cards	18
Carbon Paper and Inked Ribbons	
Carbon paper	
Coated carbon paper	19
Carbon film sheets	20
Other carbon paper	21
Inked Ribbons	
Fabric	22
Film	23
Rubber and Plastic Hose and Belts	
Rubber and plastic belts	24
Rubber hose, except garden hose	25
Rubber and plastic garden hose	26
Other hose or belts	27
Fabricated Rubber Products	
Rubber floor and wall covering	28
Other fabricated rubber products	29

Product Code List (continued)

Product	Product Code
Abrasive Products	
Sandpaper	30
Other abrasive products	31
Gaskets, Packing, and Sealing Devices	
Gaskets and gasketing materials	32
Packing and sealing devices	33
Metal Foil and Leaf	
Packages and containers	34
Gift wrap	35
Capacitor (condensor) foil	36
Other foil or leaf	37
Photographic Equipment and Supplies	
Film, silver halide type, except x-ray	
Black and white	38
Color	39
Paper and cloth, silver halide type	
Designed for black and white film	40
Designed for color film	41
Film, paper, and cloth, other than silver halide type	
Blueprint type	42
Diazo type	
Full size	43
Microfilm	44
Brownprint type	45
X-ray film	46
Other film, paper, cloth	47
Hard Surface Floor Coverings	
Linoleum	48
Vinyl Floor Coverings	49
Other floor coverings	50
Magnetic Tape	
Video tape	51
Audio tape	52
Computer tape	53
Other magnetic tape	54
Other Coating	55
Other Laminating	56

Dear Sir:

This is a reminder to complete and return, by March 20, 1981, the U. S. Environmental Protection Agency's WEB COATING AND LAMINATING QUESTIONNAIRE, dated February 16, 1981.

If you have already returned the questionnaire, we thank you and ask that you please disregard this notice.

William L. Johnson
Emission Standards and Engineering Division
U. S. Environmental Protection Agency

REMINDER/THANK-YOU POSTCARD

APPENDIX B

PRODUCT SUMMARY AND CALCULATION SHEETS

GUIDE TO CONTROL DEVICE CODES

Code	Device
N	None
C	Carbon Absorption
I	Incinerator
O	Other

Product - Flexible Packaging

Solvent Usage (pounds)				Type and Number of Control Devices	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency (%)	Proportion of Total Solvent Entering Control Device (%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
3,510,441	7,749,370	365,067	11,624,878	N-30 C-1 I-1	0 30.0 95.0	2,239,939	1,411,016	37.0	19.3	7.1

Total number of plants surveyed -- 32
Number of surveyed plants using solvent -- 32
Number of surveyed plants not using solvents -- 0
Number of establishments (From Flexible Packaging Association) -- 250

Estimated yearly solvent usage (metric tons)
A. By ratio of Flexible Packaging Association data -- 41,195
B. By factoring solvent usage upward by 3.85 -- 20,301

Estimated yearly growth rate -- 4% real growth compounded annually (1981-1984)*
Data source -- Paper, Film and Foil Converter, February 1980

Remarks:
The data presented on this summary sheet were collected by EPA in a survey of individual plants. A previous survey (Reference 4) reported total solvent usage of 35,300 tons. This total was computed by summing all quantities of solvent used for coatings, varnishes, adhesives, and cleaning as reported in Table 2 of reference 4. This does not include printing. The total solvent usage of 35,300 tons was factored upward to obtain an estimated yearly solvent usage of 83,308 tons by using a factor of 2.36. This factor was developed by dividing the number of plants included in the survey (i.e., 106) into the total number of plants that coat or laminate flexible packaging materials (i.e., 250; reference 9).

* Portions of this industry may grow at higher rates. One of these portions is multiweb packaging.

Product - Photographic Film, Paper, and Miscellaneous Products

Solvent Usage (pounds)				Type and Number of Control Devices*	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency(%)	Proportion of Total Solvent Entering Control Device(%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
15,006,115	60,980,405	7,784,493	83,771,013	N-14	0	44,302,822	5,402,847	87.8	52.9	46.4
				C-6	90.0-95.6					
				I-1	96.0					
				C,I-2	97.2					
				O-3	50.0-96.0					
				I,O-5	No data					

Estimated percentage of industry included in survey -- 99%

Estimated yearly growth rate -- 9.9%

Data source -- Predicasts, 1977 - Photographic film and sensitized plates (including X-ray) - shipments

Remarks: This category includes black and while and color film; paper and cloth designed for use with film; film, paper and cloth for blueprints, brownprints, and diazo prints (including microfilm); X-ray film; and other film, paper, and cloth. The other film, paper, and cloth category includes drafting film, transparentized paper, color proofing film, photographic packaging materials, micrographic imaging paper, color film compo nents, lithoplates, heat sensitive film, electrophotographic film, photocopy paper, X-ray screens, and non-silver films for printed circuits.

Much of this data was collected by the National Association of Photographi Manufacturers and, thus, was not collected directly from the individual companies by EPA.

* Other control devices -- an inert-gas condensation and recovery system, refrigeration, water scrubber, and catalytic incineration. Other control devices used with incineration -- not specified

Note: Concern has been expressed by the NAPM over the inclusion of solvent used in cleaning in the total solvent usage figures that are factored upward to obtain Estimted Yearly Solvent Usage. Since a large portion of this cleaning solvent is recovered, NAPM feels that it should not be included in emissions data. In addition the NAPM expressed concern over a possible misunderstanding in the solvent in coatings portion of the solvent usage. This misunderstanding could have resulted in the reporting of the total weight of the coating rather than the solvent in the coatings.

Product - Magnetic Tape

Solvent Usage (pounds)				Type and Number of Control Devices*	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency(%)	Proportion of Total Solvent Entering Control Device(%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
14,717,505	46,412,188	10,992,240	72,121,933	N-10	0	36,168,211	2,722,748	92.5	50.1	46.4
				C-12	49.7-100.0					
				I-2	96.3-100.0					
				I,0-1	99.3					

Total number of plants surveyed -- 21**
Number of surveyed plants using solvent -- 21
Number of surveyed plants not using solvents -- 0
Number of plants - estimated from independent list -- 21**

Estimated yearly solvent usage (metric tons)
A. By ratio of estimated number of establishments -- 32,714
B. By factoring solvent usage upward by 3.85 -- Not Applicable

Estimated yearly growth rate -- 13.3% annual compounded growth in shipments (square feet of tape)
Data source -- Predicasts, 1977

Remarks:
Category includes video, audio, computer, and other magnetic tape. The "other" category includes magnetic cardmedia and magnetic business and banking ribbons.

* Other control device used with incineration -- pick-up of wash solvent and waste coatings.
** Two additional plants were surveyed under this category. However, neither did web coating.

Product - Rubber Coated Fabrics

Solvent Usage (pounds)				Type and Number of Control Devices*	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency(%)	Proportion of Total Solvent Entering Control Device(%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
7,840,823	9,829,495	190,761	17,861,079	N-14 C-5 I-1 O-1	0 52.5-98.0 85.0 90.0	4,989,020	1,674,359	66.4	27.9	18.6

Total number of plants surveyed -- 40
Number of surveyed plants using solvent -- 22
Number of surveyed plants not using solvents -- 18
Number of plants listed in Census of Manufacturers -- 35

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- Not Applicable
B. By factoring solvent usage upward by 3.85 -- 31,192

Estimated yearly growth rate -- 8.0% growth in pounds of fiber (1979-1984)
Data source -- The Industrial Fabrics Market (U.S.) - fiber consumption for industrial fabrics.

Remarks:

* Other control device -- recirculation of a portion of the exhaust to the process heat generation equipment for combustion

Product - Vinyl Floor Coverings

Solvent Usage (pounds)				Type and Number of Control Devices*	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency (%)	Proportion of Total Solvent Entering Control Device (%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
24,806,319	287,234	353,520	25,447,073	I,0-2	60.0-92.6	8,053,553	3,040,994	62.2	31.6	19.7

Total number of plants surveyed -- 2
Number of surveyed plants using solvent -- 2
Number of surveyed plants not using solvents -- 0
Number of establishments listed in Census of Manufacturers -- 4

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- 23,085
B. By factoring solvent usage upward by 3.85 -- 44,439

Estimated yearly growth rate -- 7.3% growth in current dollars compounded annually
Data source -- Predicasts, 1977 - Hard surface floor coverings

Remarks:

* Other control devices used with the incinerators -- not specified.

Product - Gift Wrap (Paper and Foil)

Solvent Usage (pounds)				Type and Number of Control Devices	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency (%)	Proportion of Total Solvent Entering Control Device (%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
1,883,237	4,801,332	35,301	6,719,870	N-9	0	0	0	0	0	0

Total number of plants surveyed -- 11
Number of surveyed plants using solvent -- 9
Number of surveyed plants not using solvents -- 2
Number of establishments listed in Census of Manufacturers -- 75

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- 20,783
B. By factoring solvent usage upward by 3.85 -- 11,735

Estimated yearly growth rate -- 2.3% real growth compounded annually (1981-1985)
Data source -- 1981 U.S. Industrial Outlook - Converted paper products, n.e.c.

Remarks:

Product - Office Copier Paper

Solvent Usage (pounds)				Type and Number of Control Devices	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency(%)	Proportion of Total Solvent Entering Control Device(%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
466,496	2,962,076	0	3,428,572	C-1	90.0	3,428,572	342,857	90.0	100.0	90.0

Total number of plants surveyed -- 1
Number of surveyed plants using solvent -- 1
Number of surveyed plants not using solvents -- 0
Number of establishments listed in Census of Manufacturers -- 10

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- 15,552
B. By factoring solvent usage upward by 3.85 -- 5987

Estimated yearly growth rate -- 2.5% annual growth 1979-1985; based on projected shipments in constant dollars from historical data
Data source -- 1977 Census of Manufacturers

Remarks: Additional data received from other establishments as part of the NAPM survey. However, the data are "buried" in the "Other Photographic Film, Paper, and Cloth" category.

Product - Inked Ribbons (Fabric and Film Substrates)

Solvent Usage (pounds)				Type and Number of Control Devices	Control Device Efficiency (%)	Solvent Entering Controlg Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency(%)	Proportion of Total Solvent Entering Control Device(%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
2,274,901	5,989,668	246,365	8,510,934	N-7 C-2 I-3	0 75.5-91.4 65.5-97.9	5,632,472	780,917	86.1	66.2	57.0

Total number of plants surveyed -- 16
Number of surveyed plants using solvent -- 9
Number of surveyed plants not using solvents -- 7
Number of establishments listed in Census of Manufacturers -- 31

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- 7,480
B. By factoring solvent usage upward by 3.85 -- 14,863

Estimated yearly growth rate -- 5.3% growth in current dollars compounded annually
Data source -- Predicasts, 1977

Remarks: Inked ribbons are used for typewriters and other business machines.

Product - Nitrocellulose Coated Products

Solvent Usage (pounds)				Type and Number of Control Devices*	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency(%)	Proportion of Total Solvent Entering Control Device(%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
836,568	3,858,626	531,760	5,226,954	N-5 O-2	0 70.0	3,000,000	900,000	70.0	57.4	40.2

Total number of plants surveyed -- 8 (1 fabric, 7 paper)
Number of surveyed plants using solvent -- 7
Number of surveyed plants not using solvents -- 1
Number of establishments listed in Census of Manufacturers -- 19 (13 fabric, 6 paper)

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- 5631
B. By factoring solvent usage upward by 3.85 -- 9128

Estimated yearly growth rate -- 1.5% real growth for 1981
Data source -- 1981 U.S. Industrial Outlook - Paper coating and glazing

Remarks: Products include bookcovers, boxcovers, stencils, and photomounts.

* Other control devices -- recirculation of exhaust to burners

Product - Rubber and Plastic Belts

Solvent Usage (pounds)				Type and Number of Control Devices*	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency(%)	Proportion of Total Solvent Entering Control Device(%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
3,326,069	898,302	9,620	4,233,991	N-6 I-1 O-2	0 90.0 90.0	2,061,200	206,120	90.0	48.7	43.8

Total number of plants surveyed -- 16
Number of surveyed plants using solvent -- 9
Number of surveyed plants not using solvents -- 7
Number of establishments listed in Census of Manufacturers -- 67

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- 8,578
B. By factoring solvent usage upward by 3.85 -- 7,394

Estimated yearly growth rate -- 8.6% growth in current dollars compounded annually
Data source -- Predicasts, 1977 - Belts

Remarks:

* Other control devices -- electrostatic precipitators and DuPont catalytic abatement system

Product - Wallcoverings - Fabric and Paper Substrates

Solvent Usage (pounds)				Type and Number of Control Devices	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency(%)	Proportion of Total Solvent Entering Control Device(%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
2,262,858	1,061,276	506,156	3,830,290	N-15 C-1 I-2	0 ? 57.1-92.0	296,402	23,885	91.9	7.7	7.1

Total number of plants surveyed -- 28
Number of surveyed plants using solvent -- 18
Number of surveyed plants not using solvents -- 10
Number of establishments listed in Census of Manufacturers -- 74

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- 4591
B. By factoring solvent usage upward by 3.85 -- 6689

Estimated yearly growth rate -- >2.3% real growth compounded annually (1981-1985)
Data source -- 1981 U.S. Industrial Outlook

Remarks:

Product - Sandpaper

Solvent Usage (pounds)				Type and Number of Control Devices	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency(%)	Proportion of Total Solvent Entering Control Device(%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
166,099	769,096	92,547	1,027,742	N-3	0	0	0	0	0	0

Total number of plants surveyed -- 4
Number of surveyed plants using solvent -- 3
Number of surveyed plants not using solvents -- 1
Number of establishments listed in Census of Manufacturers -- 28

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- 3263
B. By factoring solvent usage upward by 3.85 -- 1794

Estimated yearly growth rate -- 4.5% annual growth 1979-1985, based on projected shipments in constant dollars from historical data
Data source -- 1981 U.S. Industrial Outlook - Abrasive products

Remarks:

Product - Carbon Paper

Solvent Usage (pounds)				Type and Number of Control Devices	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency(%)	Proportion of Total Solvent Entering Control Device(%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
1,451,610	57,986	20,318	1,529,914	N-6 I-2	0 65.5-98.5	151,000	40,525	73.2	9.8	7.2

Total number of plants surveyed -- 31
Number of surveyed plants using solvent -- 8
Number of surveyed plants not using solvents -- 23
Number of establishments listed in Census of Manufacturers -- 36 (Includes carbon stencils)

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- 836
B. By factoring solvent usage upward by 3.85 -- 2672

Estimated yearly growth rate -- 5.3% growth in current dollars compounded annually
Data source -- Predicasts, 1977

Remarks: Includes coated carbon paper, carbon film sheets, and other carbon paper.

Other carbon paper not using solvent--tissue carbon paper.

Product - Metal, Foil and Leaf

Solvent Usage (pounds)				Type and Number of Control Devices	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency(%)	Proportion of Total Solvent Entering Control Device(%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
124,283	1,288,350	50,437	1,463,070	N-4 I-1	0 100.0	610,385	0	100.0	41.7	41.7

Total number of plants surveyed -- 14
Number of surveyed plants using solvent -- 5
Number of surveyed plants not using solvents -- 9
Number of establishments listed in Census of Manufacturers -- 40

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- 1896
B. By factoring solvent usage upward by 3.85 -- 2555

Estimated yearly growth rate -- 11.3% growth in current dollars compounded annually
Data source -- Predicasts, 1977

Remarks:

The metal foil and leaf category includes capacitor foil and other foil or leaf. Packages and containers made from metal foil were included in the flexible packaging category. Gift wrap made from metal foil was included in the gift wrap category.

Products using solvent - foil/kraft laminates, hot-die stamping foils, and tin-lead alloy foils.

Products not using solvent - electrodeposited copper foil (2), copper foil for printed circuit boards, metallic copper foil, laminated foil, Kromecoat paper and foil/paper stocks, and aluminum foil applied to ceramic fiber blanket with sodium silicate.

Product - Polyurethane Coated Fabrics

Solvent Usage (pounds)				Type and Number of Control Devices	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency (%)	Proportion of Total Solvent Entering Control Device (%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
1,306,702	2,000	1,000	1,309,702	N-2	0	0	0	0	0	0

Total number surveyed -- 4
Number using solvent -- 2
Number not using solvent -- 2
Number of plants listed in Census of Manufacturers -- 16

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- 2376
B. By factoring solvent usage upward by 3.85 -- 2287

Estimated yearly growth rate -- 8% real growth in poundage (1979-1984)
Data source -- The Industrial Fabrics Market (U.S.); fiber consumption, industrial fabrics.

Product - Gaskets, Packing, and Sealing Devices

Solvent Usage (pounds)				Type and Number of Control Devices	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency (%)	Proportion of Total Solvent Entering Control Device (%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
611,227	224,530	26,321	862,078	N-9 I-2	0 85.0-95.0	74,642	8,245	89.0	8.9	7.9

Total number of plants surveyed -- 99
Number of surveyed plants using solvent -- 11
Number of surveyed plants not using solvents -- 88
Number of establishments listed in Census of Manufacturers -- <276

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- 1090
B. By factoring solvent usage upward by 3.85 -- 1506

Estimated yearly growth rate -- 11.0% growth in current dollars compounded annually
Data source -- Predicasts, 1977

Remarks:

Product - Shelf Paper

Solvent Usage (pounds)				Type and Number of Control Devices	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency(%)	Proportion of Total Solvent Entering Control Device(%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
12,200	5,400	9,650	27,250	N-2	0	0	0	0	0	0

Total number of plants surveyed -- 2
Number of surveyed plants using solvent -- 2
Number of surveyed plants not using solvents -- 0
Number of establishments listed in Census of Manufacturers -- 128 (includes cigarette packages)

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- 791
B. By factoring solvent usage upward by 3.85 -- 47

Estimated yearly growth rate -- 2.3% real growth compounded annually (1981-1985)
Data source -- 1981 U.S. Industrial Outlook - Converted paper products, n.e.c.

Remarks:

Product - Manifold Business Forms

Solvent Usage (pounds)				Type and Number of Control Devices	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency(%)	Proportion of Total Solvent Entering Control Device(%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
10,531	1,500	30,100	42,131	N-5	0	0	0	0	0	0

Total number of plants surveyed -- 101
Number of surveyed plants using solvent -- 2
Number of surveyed plants not using solvents -- 99
Number of establishments listed in Dun's Market Identifiers -- 478

Estimated yearly solvent usage (metric tons)
A. By ratio of Dun's Market data -- 91
B. By factoring solvent usage upward by 3.85 -- 73

Estimated yearly growth rate -- 4% real growth compounded annually (1981-1984)
Data source -- Paper, Film and Foil Converter, February 1980

Remarks: The solvent usage figures include solvent used for coating or laminating, but do not include that used for printing of business forms.

Product - Oiled, Waxed, and Wax Laminated Paper

Solvent Usage (pounds)				Type and Number of Control Devices	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency(%)	Proportion of Total Solvent Entering Control Device(%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
19,199	16,794	6650	42,643	N-2	0	0	0	0	0	0

Total number of plants surveyed -- 16
Number of surveyed plants using solvent -- 2
Number of surveyed plants not using solvents -- 14
Number of establishments listed in Census of Manufacturers -- >70

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- 84
B. By factoring solvent usage upward by 3.85 -- 74

Estimated yearly growth rate -- 1.5% real growth for 1981
Data source -- 1981 U.S. Industrial Outlook - Paper coating and glazing

Remarks:

Product - Rubber Hose (Except Garden Hose)

Solvent Usage (pounds)				Type and Number of Control Devices	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency(%)	Proportion of Total Solvent Entering Control Device(%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
0	11,824	0	11,824	N-1	0	0	0	0	0	0

Total number of plants surveyed -- 23
Number of surveyed plants using solvent -- 1
Number of surveyed plants not using solvents -- 22
Number of establishments listed in Census of Manufacturers -- 155

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- 38
B. By factoring solvent usage upward by 3.85 -- 21

Estimated yearly growth rate -- 7.6% growth in current dollars compounded annually
Data source -- Predicasts, 1977 - Hose and Tubing

Remarks:
This solvent usage covers only flat sheet coated webs. It does not include all solvent used in extruded hose or in constructing three dimensional products, i.e. not flat sheet coating. Hoses are sometimes made by wrapping cloth and film around a mandrel and using solvent-based adhesives.

Product - Other Hose and Belts

Solvent Usage (pounds)				Type and Number of Control Devices	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency (%)	Proportion of Total Solvent Entering Control Device (%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
5,900	1,000	0	6,900	N-2	0	0	0	0	0	0

Total number of plants surveyed -- 10
Number of surveyed plants using solvent -- 2
Number of surveyed plants not using solvents -- 8
Number of establishments listed in Census of Manufacturers -- 17

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- 5
B. By factoring solvent usage upward by 3.85 -- 12

Estimated yearly growth rate --
Data source --

Remarks:
Products using solvent - silicon impregnated asbestos "fire sleeve" hose protector and material handling hose.

Products not using solvent - gaskets, washers, and rubber and polyester lined hose.

Product - Miscellaneous Coated Products

Solvent Usage (pounds)				Type and Number of Control Devices*	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency (%)	Proportion of Total Solvent Entering Control Device (%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
10,324,702	11,074,695	926,028	22,325,425	N-41 C-5 I-2 O-2	0 76.9-98.0 93.0-100.0 33.0-?	4,190,775	566,086	86.5	18.8	16.2

Total number of plants surveyed -- 89
Number of surveyed plants using solvent -- 43
Number of surveyed plants not using solvents -- 46
Number of plants listed in Census of Manufacturers -- Not Available

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- Not Available
B. By factoring solvent usage upward by 3.85 -- 38,987

Estimated yearly growth rate -- Not Available
Data source --

Remarks:
Products using solvents: industrial textiles, polyurethane foam, glass, varnish coating, epoxy resin on woven fiberglass for printed circuits (2), polyethylene and mylar films, coating of polyester film with foil, acetate color filters, silicon coated glass fabric, reflective sheeting for highway signs, coating closed-cell foam, car sound-deadening materials, V-belt thread, automatic transmission plates, and aluminum pigment coated cloth, flocked board, kraft paper, reproduction papers (data graphics), adhesive coated papers, transparentized paper (2), kraft paper honeycomb, impregnated chemical text papers, supported and unsupported transfer adhesive, dry-gum adhesive paper, barrier-coated papers, after-exposure label paper, decorative laminates, paper plates, laminated glass/asbestos/polyester papers/films, mimeograph stencil papers, 100-percent rag tracing papers and vellums, acrylic coated book covers, flexo-print envelope paper, chemical sterilization indicators, waterproof writing paper, bottle capliners, friction plate, automotive clutch and filters, and typewriter ribbon cover-up.

(Continued)

Product - Miscellaneous Coated Products (Continued)

Products not using solvent - electrolytic recording papers (2), animal glue bonded papers, laminated glass/asbestos papers and film, folding cartons, paper yarns and cords, folders, index cards, guides, adding machine and cash register rolls, paper honeycomb, corrugated paperboard packaging and boxes, paper novelties and decorations, party favors, cold wave end papers, placemats, calendar roll paper, paperboard, latex impregnated paper, oiled paper, corrosion inhibiting paper, converted wet wipes, polyethylene coated milk carton stock, notebook paper, envelopes, writing tablets, overlay paper, gift tags, paper bags, creped paper, and phenolic resin impregnated kraft linerboard. Includes many custom job shops where the product may vary from day to day.

* Other control devices -- recirculation of a portion of the exhaust to a burner and an afterburner.

Product - Laminated or Coated Rolls and Sheets

Solvent Usage (pounds)				Type and Number of Control Devices*	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency (%)	Proportion of Total Solvent Entering Control Device (%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
7,962,738	562,642	447,425	8,972,805	N-14 I-1 O-1	0 100.0 33.3	319,000	28,000	91.2	3.6	3.2

Total number of plants surveyed -- 35
Number of surveyed plants using solvent -- 16
Number of surveyed plants not using solvents -- 19
Number of establishments listed in Census of Manufacturers -- 134

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- 15,582
B. By factoring solvent usage upward by 3.85 -- 15,670

Estimated yearly growth rate -- 1.5% real growth for 1981
Data source -- 1981 U.S. Industrial Outlook - Paper coating and glazing

Remarks: A total of 25 establishments using solvents submitted questionnaires under this product category. Of these 25 establishments, ten were flexible packagers and were included in the flexible packaging category. Some of the remaining 15, as well as some of the 19 that did not use solvent, could be manufacurers of flexible packaging.

* Other control device -- recirculation of a portion of the exhaust stream back to burner

Product - Other Coated Fabrics

Solvent Usage (pounds)				Type and Number of Control Devices	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency (%)	Proportion of Total Solvent Entering Control Device (%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
1,604,647	1,298,890	133,139	3,036,676	N-12 C-2 I-2	0 No data 98.0-99.0	359,190	5411	98.5	11.8	11.7

Total number of plants surveyed -- 23
Number of surveyed plants using solvent -- 16
Number of surveyed plants not using solvents -- 7
Number of establishments listed in Census of Manufacturers -- 28 (not including vinyl coating)

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- 1676
B. By factoring solvent usage upward by 3.85 -- 5303

Estimated yearly growth rate -- 4.5% annual growth 1979-1985; based on projected shipments in constant dollars from historical data
Data source -- 1981 U.S. Industrial Outlook

Remarks:
Products using solvent - window shades, scrim coat, flocked fabrics, vinyl organasol coated fabrics, aircraft insulation, SRM-nonwoven fabric composite, table covers, CAB lacquer on fabric, card cloth foundations, buffing wheels, polishing buffs of cotton, sisal, etc., adhesive coated glasscloth, friction materials, phenolic coated fabric, and black or bondable filament.

Products not using solvent - PVC sheeting coated with lead base pigment, animal glue bonded fabric, various rubber and plastic coatings on fabric, polyester/PVC plastisol laminates on fabric, pipe wrap (waxed cloth), and Teflon® coated glass fabric.

Product - Miscellaneous Laminated Products

Solvent Usage (pounds)				Type and Number of Control Devices*	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency(%)	Proportion of Total Solvent Entering Control Device(%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
358,401	339,922	29,410	727,733	N-8 I-1 O-1	0 100.0 35.1	113,600	40,600	35.7	15.6	10.0

Total number of plants surveyed -- 15
Number of surveyed plants using solvent -- 12
Number of surveyed plants not using solvents -- 4
Number of plants listed in Census of Manufacturers -- Not Available

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- Not Applicable
B. By factoring solvent usage upward by 3.85 -- 1,271

Estimated yearly growth rate --
Data source --

Remarks:
Products using solvent - various materrials (including vinyl, cotton, foam, fabric, Tricot, etc.) for shoes and handbags, reinforced plastic and rubber, pressure sensitive adhesives on foam rubber, vulcanized fiber, polyester/paper for printed circuit boards, vinyl plastic to particle board, plastic and captan film to metal, cable wrap, and copper flex-web backing.

Products not using solvent - heat laminated paper/plastic, fabric for shoes and slippers, triple laminated vinyl/nylon/dacron, and nonwoven fabric textile fibers chemically and heat bonded.

This category contains many custom job shops whose product may vary from day to day.

* Other control device -- recirculation of exhaust to burners

Product - Other Fabricated Rubber Products

Solvent Usage (pounds)				Type and Number of Control Devices	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency (%)	Proportion of Total Solvent Entering Control Device (%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
112,607	368,283	121,936	602,826	N-17	0	0	0	0	0	0

Total number of plants surveyed -- 93
Number of surveyed plants using solvent -- 17
Number of surveyed plants not using solvents -- 76
Number of establishments listed in Census of Manufacturers -- Data not complete; large number (hundreds)

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- Not Available
B. By factoring solvent usage upward by 3.85 -- 1052

Estimated yearly growth rate -- 2-3% real growth compounded annually (1981-1985)
Data source -- 1981 U.S. Industrial Outlook - Fabricated rubber products

Remarks:
Products using solvents - laminated shoe soles and heels, rollers, custom molded rubber goods, fabricated latex foam rubber sheets and shades, blood pressure bags, synthetic rubber soling sheets, perimeter sealing devices, friction materials, molded rubber to metal, and rubber and plastic linings for tanks, pipe, and valves.

Products not using solvents - rubber rollers, tank linings, polyurethane castings, baseball and softball cores, sheet and cellum rubber composites, truck tire flaps, swab cups, elastomeric closures (5), steel laminated elastomeric bearing pads, rubber stoppers, rubber footwear, polyurethane foam, tubes, liferafts, erosion shoes, seals and rollers, rubber bellows, rubber shoe soling sheets, rubber to metal vibration insulators, light sockets, garter buttons, valve disks and liners, prophylactics and diaphragms, toy rubber balloons, rubber floor mats, vulcanized cleats on conveyor belts, rubber covered rolls, rubber hose and duct, and "O" rings.

Note: This survey tried to concentrate on flat web coating in this industry. Thus much of solvent used for rubber extrusion is not included here.

Product - Other Abrasive Products

Solvent Usage (pounds)				Type and Number of Control Devices	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency (%)	Proportion of Total Solvent Entering Control Device (%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
1836	0	660	2496	N-1	0	0	0	0	0	0

Total number of plants surveyed -- 29
Number of surveyed plants using solvent -- 1
Number of surveyed plants not using solvents -- 28
Number of establishments listed in Census of Manufacturers -- Data not complete (hundreds)

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- Not Available
B. By factoring solvent usage upward by 3.85 -- 5

Estimated yearly growth rate -- 4.5% annual growth 1979-1985, based on projected shipments in constant dollars from historical data
Data source -- 1981 U.S. Industrial Outlook - Abrasive products

Remarks:

Product - Greeting Cards

Solvent Usage (pounds)				Type and Number of Control Devices	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency (%)	Proportion of Total Solvent Entering Control Device (%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
0	350	570	920	N-2	0	0	0	0	0	0

Total number of plants surveyed -- 37
Number of surveyed plants using solvent -- 2
Number of surveyed plants not using solvents -- 35
Number of establishments listed in Dun's Market Identifiers -- 141

Estimated yearly solvent usage (metric tons)
A. By ratio of Dun's Market data -- 2
B. By factoring solvent usage upward by 3.85 -- 2

Estimated yearly growth rate -- 8.0% growth in current dollars compounded annually
Data source -- Predicasts, 1977

Remarks: The solvent usage figures represent solvent used in coating and laminating operations, but do not represent solvent used for printing of greeting cards.

Product - Shoe Fabric

Solvent Usage (pounds)				Type and Number of Control Devices	Control Device Efficiency (%)	Solvent Entering Control Device (Pounds)	Solvent Exhausted From Control Device (Pounds)	Average Control Device Efficiency (%)	Proportion of Total Solvent Entering Control Device (%)	Overall Industry Percent Control (%)
In Coatings	Added to Coatings	For Cleaning	Total							
750,000	0	0	750,000	N-1	0	0	0	0	0	0

Total number of plants surveyed -- 1
Number of surveyed plants using solvent -- 1
Number of surveyed plants not using solvents -- 0
Number of establishments listed in Census of Manufacturers -- 68

Estimated yearly solvent usage (metric tons)
A. By ratio of Census of Manufacturers data -- 23,133
B. By factoring solvent usage upward by 3.85 -- 1310

Estimated yearly growth rate -- -11.9% growth in current dollars compounded annually
Data source -- 1981 U.S. Industrial Outlook - Rubber and plastics footwear

Remarks: